Al-AHLIYYA AMMAN UNIVERSITY

FACULTY OF ENGINEERING

DEPRTMENT OF MEDICAL ENGINEERING

COURSE DESCRIPTION

of

MEDICAL ENGINEERING PROGRAM

Number of Credit Hours: 160 Cr. Hr.

Course Labeling Code

Faculty	Code	Department Code	Year Level	Field Subject	Serial	Number

Example:

0	8	2	4	2	0	4

08 Faculty of Engineering Code.
2 Department Code.
4 Year Level.
2 Field Subject.
04 Serial Number of the Course in the Field.

Course Information

Course Name {No. of Credit Hours} [Lectures – Contact Hours]
Example: Power Electronics {3} [3-3]
{3} 3 Credit Hours.
[3-3] 3 Lectures, 3 Contact Hours a week.

A0111101 Mathematics (1) {3}[3-3]
Functions and Models: Four ways to represent a function, Trigonometric Functions, Exponential Functions, Inverse Functions and Logarithms; Limits and Derivatives : The Limit of a Function, Continuity, Limits at Infinity, Horizontal Asymptotes, Derivatives of Polynomials and Exponential Functions, Hyperbolic Functions; Applications of Differentiations : L'Hospital's Rule and Indeterminate Forms, Maximum and Minimum Values, Optimization Problems; Integrals and Applications : The Definite and Indefinite Integrals, The Substitution Rule, Areas between Curves, Volumes, Volumes by Cylindrical Shells.

Prerequisite: None

A0111102 Mathematics (2) {3}[3-3]
Techniques of Integration: Integration by Parts, Integration, Trigonometric Integrals, Trigonometric Substitution, Integration by Partial Fractions, Strategy for Integration, Improper Integrals; Polar Coordinates and its Applications; Sequences and Series: Sequences and Series Convergence Tests, Maclaurin's and Taylor's Formulas, Applications on Sequences and Series.

Prerequisite: A0111101 Mathematics (1)

A0111201 General Physics (1) {3} [3-3]
Units Physical Quantities; Vectors; Motion in One Dimension; Motion in Two Dimensions; The Laws of Motion: Force and Interaction, Newton's laws, Mass and Weight, Friction; Energy of a System: Work, Kinetic Energy, Potential Energy, Power; Momentum Impulse and Collisions; Dynamics of Rotational Motion: Torque, static, Conditions for Equilibrium, Center of Gravity; Fluid Mechanics: Static Fluid, Dynamic Fluid ; Oscillatory Motion; Wave Motion.

Prerequisite: None

A0111202 General Physics (2) {3} [3-3]
Electrostatics: Electric Charges, Coulomb's Law, Electric fields; Gauss's law; Electric potential; Capacitance and Dielectrics; DC-Circuits: Current, Resistance, Electromotive Force; Magnetostatics: Magnetic Field, Magnetic Forces; Sources of Magnetic Field; Electromagnetic Induction; Inductance; Alternating Current Circuits; Electromagnetic Waves.

Prerequisite: A0111201 General Physics (1)

A0111203 General Physics Lab. {1} [1-2]
Experimental error and data analysis; Measurements; Force Table; Motion in One and Two Dimensions; Newton's Second Law; Friction; Work and Energy; Simple Harmonic Motion: Simple Pendulum, Spring Mass system; Electricity: Ohm's Law, and Kirchhoff's Law.

Co-requisite: A0111201 General Physics (1)

A0111301 General Chemistry {3} [3-3]
Matter Classification and Properties: Elements, Atoms, Ionic and Covalent Compounds; Measurements and Dealing with Numbers; Periodic Table Chemical Calculations; Chemical Reactions in Solutions; Redox Reactions; Electronic Structure of Atoms; Basics of Chemical Bonding and Structure of Molecules; Properties of Gases, Liquid and Solid State; Intermolecular Forces; Solutions and Concentrations; Physical Properties of Solutions; Kinetics: To Study The Rates of Reactions, Acid-Base Equilibrium, pH Measurements, Thermo Chemistry and Thermodynamics, Energy and Chemical Changes.

Prerequisite: None

A0112101 Linear Algebra {3} [3-3]

Linear algebra: Matrices, Vectors, Determinants, Solution of Linear Systems of Equations, Inverse of a Matrix; Matrix Eigenvalues Problems: Eigenvalues, Eigenvectors, and Diagonalization; Complex Analysis: Complex Numbers and Functions, Analytic and Harmonic Complex Functions, Exponential, Trigonometric and Logarithmic Complex Functions.

Prerequisite: A0111102 Mathematics (2)

A0811201 Computer Skills (Engineering) {3} [3-3]

The basic concepts of programming using C++ language: C++ programming; controls structures; functions; arrays; pointers; an introduction to classes and objects.

Prerequisite: A0331700 Computer Skills (remedial)

A0811202 Engineering Workshop {1} [1 – 2]

Workplace safety and use of tools; basic skills of measurements; basic skills of hand filing, welding, carpentry, sheet metal fabrication, and household electric circuits.

Prerequisite: None

A0812201 Communication Skills and Engineering Ethics {3} [3-3]

Basics of Communication Skills: Communication Process, Verbal and Non-Verbal Communication, Barriers to Communication; Listening Skills, Types of Listening, Speaking Skills: Strategies for Developing Speaking Skills, types of Speaking, Effective Presentation Strategies; Reading Skills: Reading Techniques, Reading Comprehension; Writing Skills: Attributes of Technical Writing, Benefits of Technical Writing, Types of Writing, Research Papers, Technical Reports, Job Application.

Engineering ethics: applied engineering ethics and moral principles; engineer's right's responsibilities and obligations towards society, clients and his engineering profession; engineering code of ethics.

Prerequisite: A0161201 English Communication Skills

A0831201 Engineering Drawing {2} [2 – 4]

Use of instruments; lettering; Drawing of basic views and projection method; orthographic; isometric drawing and sketching; sectional views; computer aided design applications using AutoCAD (2D & 3D) in all engineering aspects.

Prerequisite: None

A0832101 Differential Equations {3} [3-3]

Different methods of solving ordinary differential equations applicable to the first, second and higher-order DEs, linear and nonlinear DEs, homogeneous and nonhomogeneous DEs as an engineering application, modeling of some engineering, physical, and social problems will be given.

Prerequisite: A0111102 Mathematics (2) (to be passed)

A0832102 Engineering Statistics {3}[3-3]

Applications of statistics in engineering; Introduction to descriptive statistics, presentation and treatment of data; introduction to probability theory and probability distribution (discrete and continuous); counting techniques; sampling theory; statistical estimation; statistical hypothesis testing; correlation; finding regression equations and regression analysis.

Prerequisite: A0111101 Mathematics (1)

A0833101 Numerical Analysis {3} [3-3]

General numerical methods: equation solving via iteration, interpolation; numerical integration, and numerical differentiation; numerical methods in linear algebra, Gauss elimination, least squares method, numerical methods for differential equations.

Prerequisite: A0112101 Linear Algebra

A0832601 Biomechanics (1) {3} [3-3]

Introduction to biomechanics, tensile, compressive and frictional forces, force and vectors, momentum and torque, analysis of systems in equilibrium, application of statistic to biomechanics, center of gravity and centroids, Introduction to deformable body mechanics.

Prerequisite: A0111201 General Physics (1) (to be passed)

A0833301 Medical Electronics {3} [3-3]

Introduction to Op-Amp; Basic Op-Amp Circuits: Summing Amplifiers, Comparators, Integrators, Differentiators, Biomedical Applications; Special purpose op-amp applications: Differential amplifier, Instrumentation amplifier, Isolation Amplifier, Converters, Biomedical Applications; Active Filters: Low, high, band pass and band stop active filters, filters in biomedical applications; Oscillators: Principles of Oscillators, Phase Shift Oscillator, Wien Bridge Oscillator, Colpitts Oscillators and Hartly Oscillator. Power Amplifiers and their classification, Power Amplifiers in biomedical applications.

Prerequisite: A0822502 Electronics

A0833302 Simulation Lab. for Medical Engineering {1} [1-2]

This Lab provides a set of experiments using NI- Multisim and LabVIEW that aim to enhance student's skills in simulation field; These simulation software help to design, build and analyze some biomedical electronic circuits virtually as well as mathematical models; they can also help students to implement their projects by converting the simulated circuit schematic to Printed Circuit Board (PCB) or by dealing with some Data Acquisition Systems (DAQ).

Prerequisite: A0833301 Medical Electronics

A0833601 Biomechanics (2) {3} [3-3]

Deformable body mechanics; stress, strain, Axial loading, Material properties obtained from tensile tests, elastic deformation, plastics deformation, hooke's law; Mohr's circle, Torsion, bending, Viscoelasticity, empirical models of Viscoelasticity, common characteristic of biological tissues; biomechanics of musculoskeletal system; intrinsic mechanical properties of the blood vessels; introduction to finite element analysis (FEA), Using FEA for the simulation of artificial joint implants using SolidWorks.

Prerequisite: A0832601 Biomechanics (1) (to be passed)

A0833602 Biomaterials {2} [2-2]

An introduction about Biomaterials; it demonstrates the bulk and surface properties of materials; It deals with many details about the following engineered biomaterials: metals, polymers, hydrogels, ceramics, glasses, and glass-ceramics, composites, Bioresorbable and bioerodible materials, natural materials, and their use in implant technology; It explains the

tissue engineering subject, host reaction to biomaterials and testing biomaterials; It clarifies many applications of materials in medicine and dentistry.

Prerequisite: A0111301 General Chemistry

Co-requisite: A0833601 Biomechanics (2)

A0834301 Computer Applications in ME {3} [3-3]

This course gives an introduction to use MATLAB and LabView software in engineering programming; It will cover matrix generation, array operations and solving Linear equations at the beginning, then it will deal with liner data and apply data interpolation using different methods; Moreover, this course cover the methods used for medical signal processing, and medical image processing; It will explain the main components of Data acquisition (DAQ) system and Exploring the DAQ toolbox, then connect it with LabView software.

Prerequisite: A0811201 Computer Skills (Engineering)

Prerequisite: A0112101 Linear Algebra

A0834302 Medical Instrumentation (1) {3} [3-3]

Introduction to electrical measurements and instrumentation; basic concepts in medical instrumentation; bio-potential electrodes; medical signals and measurements (ECG, EEG, EMG, EOG and ENG); blood pressure and flow measurements and instrumentation; heart sounds; cardiac output measurement techniques.

Prerequisites: A1112204 Physiology

Prerequisites: A0833301 Medical Electronics

A0834303 Medical Sensors and Biotelemetry {3} [3-3]

Principles of biomedical sensor design; biomedical sensors charactristics; biomedical sensors applications in medicine and biology: resistive, inductive, magnetic, ultrasonic, chemical, and optical sensors; biosensors; introduction to biotelemetry: analog and pulse modulation, demodulation techniques; basic telecommunication circuits designed for transmission of biomedical signals; transmitters and receivers; applications of telemedicine in health care.

Prerequisite: A0834302 Medical Instrumentation (1)

Prerequisite: A0823402 Communication Systems

A0834304 Medical Instrumentation (2) {3} [3-3]

Respiratory system instrumentation; thermometry; audiometry; electronic patient monitoring systems; therapeutic and prosthetic devices; electrosurgery and operating room equipment; sterilization; chemical biosensors and clinical laboratory equipment; microprocessor interfacing and computer based instrumentation.

Prerequisite: A0834302 Medical Instrumentation (1) (to be passed)

A0834305 Medical Instrumentation Lab {1} [1-3]

Medical signal conditioning and processing: signal calibration, signal amplification, filtration, medical signal measurements (ECG, EEG, EMG); heart rate measurement (visual and sound indicators); analogue to digital converter; safety analyzer; interfacing with computers

Co-requisite: A0834304 Medical Instrumentation (2)

A0834306 Medical Sensors and Biotelemetry Lab {1} [1-2]

Introduction to medical sensors and medical measurement system using LabView and ELVIS II kit; sensing and detection of various physiological variables such as: temperature, force, blood pressure, heart rate, and heart sounds; signal modulation and demodulation techniques (AM, FM) transmitter and receiver; signal sampling and reconstruction; telemetry applications in health care.

Prerequisite: A0834303 Medical Sensors and Biotelemetry

A0834601 Medical Rehabilitation Engineering {3} [3-3]

Introduction to medical rehabilitation engineering; Seating biomechanics and systems; Tissue integrity management: Pressure ulcer staging systems, support-surface classification; Wheelchairs: Manual wheelchairs, electric power wheelchairs, multifunctional wheelchair, wheelchair standards. Functional electrical stimulation: Clinical considerations of FES, electrodes, clinical application of FES, FES for foot drop, FES for walking, FES for upper extremity function, FES for exercise, spinal cord stimulation, deep brain stimulation, wearable technology; Physiotherapy instrumentation; Wheelchair transportation safety; Aids for people who are blind or visually impaired; Maximizing participation for people with hearing loss; Basic principles of alternative telecommunication, basic methods used in assessing a person for computer access and web accessibility; Adaptive sports and recreation technology.

Prerequisite: A0833601 Biomechanics (2).

Co-requisite: A0834303 Medical Sensors and Biotelemetry.

A0834602 Biomechanics and Rehabilitation Lab {1} [1-2]

Experimental techniques for determining stress-strain curve; vibration analysis; measurement of young's modulus of materials that are used in artificial joints and medical implants in general; fatigue test of biocompatible materials; Brinell hardness test for biocompatible materials; Gait analysis; for the rehabilitation part: Obtaining the significant rehabilitation body data (body surface area, body density , body volume , body %fat and blood volume) also taking blood pressure, pulse rate and breathing rate in rest case and action case, Determination the Radiated Heat Diathermy From Barred Arm , Determination the Subcautanous Muscle Temp; finally Determination of a Body mass lost after Hard Exercise and Distinguish between different methods of mass loosing.

Co-requisite: A0834601 Medical Rehabilitation Engineering

A0834701 Field Training {3} [8weeks]

Practical experience to be gained through working for eight continuous weeks in an accredited establishment.

Prerequisite: Pass of 115 Cr.H.

A0835301 Design Concepts in Biomedical Engineering {3} [2-2]

Engineering design procedures and relevant information necessary for designing biomedical devices; design concepts of projects in the biomedical engineering field: presentation skills, communication skills, team work, concept generation and documentation specifications, evaluation, design validation and clinical trials; regulations and ethics in biomedical engineering design

Prerequisite: A0834304 Medical Instrumentation (2)

A0835302 Medical Technology Management {2} [2-2]

Basic concepts of the management of medical technology in hospital settings including safety considerations, codes, standards, regulations; procedures in planning, acquisition, controlling, leading and supervision; other medical engineering practices in medical engineering departments and healthcare facilities.

Prerequisite: A0834304 Medical Instrumentation (2)

A0835401 Medical Imaging Systems {3} [3-3]

Introduction to medical imaging systems; properties and nature of produced image of particular imaging system; medical imaging systems are: X-ray, CT-Scan, imaging by radioisotopes and gamma camera, projection Positron Emission Tomography (PET), ultrasound imaging systems, Magnetic Resonance Imaging (MRI).

Prerequisite: A0834304 Medical Instrumentation (2)

A0835402 Medical Digital Image Processing {3} [3-3]

The course begins with low level processing and works its way up to the beginnings of image interpretation; This course explains the two-dimensional discrete systems, design of two-dimensional filters, digital image processing, human perception of images, color models, sampling and data compression, picture enhancement, restoration and analysis, hardware and software implementation. Students will be required to apply their understanding of the concepts involved through the use of suitable package (e.g. Matlab).
Prerequisite: A0823401 Signals and Systems (to be passed)

A0835501 Selected Topics in Medical Engineering {3} [3-3]

Current trends and developments in the field of biomedical engineering; contemporary issue in biomedical engineering; each semester will cover one topic which will be announced for students at the registration time.

Prerequisite: Department Approval

Co-requisite: A0835301 Design Concepts in Biomedical Engineering.

A0835701 Graduation Project (1) {1}[1-2]

Each student (or a team of students) may choose from a list of research projects, and is/are supervised by a faculty member in the department. Project (1), which represents the first phase of the graduation project, requires gathering the practical and theoretical resources needed for the completion of graduation project (2).

Prerequisite: A0834701 (to be passed) / Pass Field Training
Co-requisite: A0835301 Design Concepts in Biomedical Engineering.

A0835702 Graduation Project (2) {2}[2-4]

The student implements and finalizes the work described in project (1). After full implementation of the project's goals, the student must present a comprehensive report on the entire graduation project to an examining committee.

Prerequisite: A0835701 Graduation Project (1)

A1111103 Anatomy {3} [3-3]

Basic concepts of biology: cell structure and function, cell biochemistry and metabolism; molecular biology of the cell; chemical composition of the body ,the basic human tissues and the following systems of human body: nervous system, cardiovascular system, muscles system, blood, respiratory system, and sensory system. Anatomy of the kidneys. The integumentary system. Bones and skeletal tissues; joints.
Prerequisite: None

A1112204 Physiology {3} [3-3]

Introduction to physiology; human body; normal functions and mechanism of various physiological systems: nervous system, cardiovascular system, muscles system, respiratory system, human nervous system, sensory system, and skeletal system; Physiology of the Kidneys.

Prerequisite: A1111103 Anatomy

A0812401 Digital Logic Circuits {3} [3-3]

Numbering System and Information Representation: Arithmetic Operations, Decimal and Alphanumeric Codes, Binary Logic; Boolean Algebra: Identities, Functions and Manipulation, Standard Forms, Simplification, Logic Gates, Integrated Circuits; Combinational Logic Design: Circuits (Gate Level), Design Hierarchy and Procedures, Computer-Aided Design, Combinational Two-Level and Multi-Level Implementations, Arithmetic (Add, Subtract, Multiply) and Other Popular Modules (Multiplexers, Encoders, Decoders); Sequential Logic Design: Latches, Flip-Flops, State Machine Design and Minimization (Mealy Digital and Moore Models); Design Problems.

Prerequisite: A0111101 Mathematics (1)

A0812402 Digital Logic Circuits Lab. {1} [1-2]

The Digital Logic Circuits laboratory develops students with the ability of identifying the digital logic gates and combinational logic circuits such as adders, decoders. Students are also conducting experiment with memory elements (flip-flops) and sequential logic circuits.

Co-requisite: A0812401 Digital Logic Circuits

A0813201 Engineering Economy and Management {3} [3-3]

Engineering Project Development; Decision Making; Basic Concepts of Capital Investment: Formulas and Applications, Rates of Return, Economic Feasibility of Projects (Net Future Value, Net Present Value, and Equivalent Uniform Cash Flow); Comparison of Mutually Exclusive Proposals; Benefit-Cost Ratio Method; Depreciation; Corporate Taxation; Resource Allocation.

Prerequisite: A0111101 Mathematics (1)

A0822502 Electronics {3} [3-3]

Introduction to electronics; semiconductors: intrinsic and extrinsic semiconductors, electrical properties of semiconductors, diffusion process in semiconductors; the PN junction diode: forward, reverse biased junction, V/I static characteristics, diode types: zener, LED, and photodiode; diode applications: rectification, clipper, and clamper circuits, voltage multipliers; bipolar junction transistors: CB and CE Characteristics, DC biasing and analysis; BJT applications: BJT as a switch, and amplifier; field-effect transistor: V/I Characteristics of JFET and MOSFET, DC biasing and analysis; biasing of transistor (BJT and FET); single-stage amplifier; cascaded BJT and FET amplifiers; composite transistor stages; operational amplifiers and applications; differential amplifier; operational amplifier architectures; frequency response of amplifiers; negative-feedback amplifiers.

Prerequisite: A0872303 Electrical Circuits (to be passed)

A0823502 Electronics Lab {1} [1-2]

Diode characteristics: clipping and clamping circuits, half-wave and full-wave rectification, Zener diode, and voltage regulation; BJT characteristics and biasing circuits; FET characteristics and biasing circuits; transistor amplifiers; frequency response of single-stage and multi-stage transistor amplifiers, transfer characteristics of cascade amplifier; differential amplifier; operational amplifiers and applications; oscillators; passive and active filters.

Co-requisite: A0822502 Electronics

A0823401 Signals and Systems {3} [3-3]

Classification of signals, basic concepts of sampling, basic continuous-time and discrete-time signals; signal processing using MATLAB; classification of systems, properties of continuous-time LTI systems, proprieties of discrete-time LTI systems, convolution processes, Laplace transform, transfer function; Fourier series; Fourier transform and applications, power spectral density, frequency response.

Prerequisite: A0872303 Electrical Circuits

A0823402 Communication Systems {3} [3-3]

Review of Fourier transforms; spectra, filters, and Hilbert transform; analog modulation techniques: AM, FM, and PM; band-pass noise representation: noise performance of analog modulation; FDM; Nyquist criteria; matched filter and noise performance; inter symbol interference (ISI) and ways to address this problem; binary band-pass transmission: BASK, BFSK, BPSK, and DPSK; geometric representation of signals: orthogonal signals, correlation receivers and signal constellations; M-ary band-pass digital transmission: ASK, PSK, FSK, and QAM; noise performance and bandwidth efficiency; synchronization.

Prerequisite: A0823401 Signals and Systems

A0823503 Digital Electronics {3} [3-3]

Digital electronic signals and switches: digital signal, clock waveform, serial and parallel representation, applications of relay, diode and BJT as a switch; digital logic families: RTL, DTL, TTL, ECL, MOS and CMOS logic family, interfacing between families; timing circuits: bistable, monostable, astable circuits and 555-timers; interfacing to the analog world: DAC and ADC circuits, sample and hold circuits; memory concepts: RAM, ROM, magnetic and optical storage.

Prerequisite: A0822502 Electronics

A0823504 Digital Electronics Lab {1} [1-2]

Characteristics of switching devices, characteristics of logic gates: RTL, TTL, and COMS; interfacing of TTL & CMOS gates; analysis and design of multivibrators circuits; application of 555 timer; DAC and ADC circuits.

Co-requisite: A0823503 Digital Electronics

A0824403 Digital Signal Processing {3} [3-3]

Sampling and aliasing; review of discrete time signals and systems; z-transform and its application to the analysis of LTI systems; digital signal processing (DSP) using MATLAB; discrete-time Fourier transform (DTFT); frequency response of LTI systems; discrete Fourier transform (DFT); structures for FIR and IIR filters; introduction to the design of digital filters; applications of DSP: speech processing and image processing.

Prerequisite: A0823401 Signals and Systems

A0872303 Electrical Circuits {3} [3 – 3]

Introduction to electrical engineering. Fundamentals of electric circuits, Concepts of voltage, current, power, resistance capacitance and inductance. Circuit analysis techniques such as Kirchhoff's Laws, node voltages, and mesh currents. Thevenin's and Norton's equivalent circuits, sinusoidal steady state and phasors, power in ac circuit, balanced three phase circuit series and parallel resonant.

Prerequisite: A0111202 General Physics (2)

A0872304 Electric Circuits Lab. {1} [1 – 2]

DC circuits: Kirchhoff's voltage and current laws, network theorems, maximum power transfer; transient circuits: RL, RC, RLC; resonant circuits; magnetically coupled circuits; two-port networks.

Co-requisite: A0872303 Electrical Circuit

A0873501 Machines and Electrical Power {3} [3 – 3]

Analysis of AC power and review of three phase circuits, active reactive and complex power, per unit quantities, Power transformers (single phase and three phase). DC machines, induction machine, synchronous machine; permanent magnet synchronous machine. Introduction to electrical power systems, transmission line modelling. Fault analysis(symmetrical).

Prerequisite: A0872303 Electrical Circuits

A0874501 Control Systems {3} [3-3]

Concept of control systems; open-loop and closed-loop systems; mathematical modeling of physical systems; transfer function and system modeling diagrams; response characteristics of control systems; specifications of system performance; stability analysis of linear control systems; Routh's stability criterion; time-domain analysis of control systems; design of controllers and compensators.

Prerequisite: A0823401 Signals and Systems

A0813403 Microprocessors and Embedded Systems {3} [3-3]

Introduction to microprocessor and microcomputer; the 8086/8088 microprocessors and their architecture; addressing modes; instruction set; programming the microprocessor using assembly languages; introduction to embedded systems; introducing PIC 16 series: architecture overview of PIC16F84A, the 16F84A memory; building assembly programs: introduction to assemblers, PIC 16 Series instruction set; parallel ports; interrupts; counters and timers.

Prerequisite: A0812401 Digital Logic Circuits

A0834401 Data mining and pattern recognition {3} [3-3]

This course is focuses on collecting data and extraction of useful information from them. It explains methods used in: data visualization, data analysis and uncertainty. It gives an overview of data mining algorithms, models and patterns, it includes generative methods such as those based on Bayes decision theory and related techniques of parameter estimation and density estimation.

Prerequisite: A0834301 Computer Applications in ME

A0834603 Fluid Mechanics for ME {3} [3-3]

Fundamental laws of statics, and dynamics applied to fluid; characteristics of fluids; conservation of mass, momentum, and energy as applied to fluids; laminar and turbulent flows; shear stress; applications of fluid mechanics to biological systems: human circulatory, blood flow in heart, arteries, veins. Respiratory systems, including air flow in the lugs,

Prerequisite: A0833601 Biomechanics (2)

A0834604 Tissue Engineering {3} [3-3]

Introduction in tissue engineering, fundamental principles of tissue engineering, cell sources for tissue engineering, biomaterials and scaffolds for tissue engineering, growth factors and cell signalling in tissue engineering, bioreactor systems and design, cardiovascular tissue engineering, connective tissue engineering, neural tissue engineering, ethical issues and considerations for tissue engineering

Prerequisite: A0834601 Medical Rehabilitation Engineering

Prerequisite: A0833602 Biomaterials

A0835303 Laboratory Instrumentation and Medical Laser {3} [3-3]

Study of the scientific bases and design strategies for preparatory and analytical laboratory instrumentation, blood cold chain laboratory equipment, histology and histopathology equipment, hematology analyzers, electro-analytical chemistry and blood gas instrumentation. Basic physics of lasers. Laser-tissue interaction. Types of laser used in medicine. Lasers in diagnostics. Laser therapy and surgery: Laser therapy in ophthalmology; Lasers in dermatology; Lasers in cardiology; Lasers in neurology; Laser safety: Regulations, standards, and guidelines for practice.

Prerequisite: A0834304 Medical Instrumentation (2)

A0835304 Implanted Medical Devices {3} [3-3]

The purpose of this course is for students to gain knowledge and experience in designing medical implants. Topics include the principles of medical device and implant design; design parameters and specifications; design for an assistive product, engineering analysis; preclinical testing for safety and efficacy, risk/benefit ratio assessment, evaluation of clinical performance and design of clinical trials.

Prerequisite: A0834304 Medical Instrumentation (2)

A0835403 Bioinformatics {3} [3-3]

This course covers the sources of health information systems and their relation to health agencies; A study is made of the origin and purpose, content, assembly, analysis and use of medical records; The course will introduce software applications used in HCIS; The student will develop an understanding of the implications of integrated versus interfacing disparate HCIS application, database management and patient privacy issues; The course will examine emerging technology in the areas of health care, access to Electronic Medical Records, and Regional Health Information Organizations; Methods of compiling, numbering, filing and retention of health information.

Prerequisite: A0834301 Computer Applications in ME

A0835601 Prosthetic and Artificial Organs {3} [3-3]

Extracorporeal devices: artificial kidney: artificial heart; artificial liver; artificial blood; artificial pancreas; artificial knee implants, artificial hip implants, artificial disc implant, upper and lower extremities mechanics; essential parts in artificial limbs.

Prerequisite: A0834601 Medical Rehabilitation Engineering

A0835602 Nanotechnology in ME

Introduction to nanotechnology, physics in nanotechnology, synthesis of nanomaterials, characterisation of nanomaterials, bio-nanomaterials and nanodevices, nanotechnology applications in biology and medicine.

Prerequisite: A0834601 Medical Rehabilitation Engineering

A0161100 Arabic Language (Remedial) {3} [3 – 3]

The concept of language and its levels, comprehension and speaking; grammar exercises; nominal sentences, verbal sentences, kana and its sisters, inna and its sisters, masculine plural, feminine plural, singular, dual, numbers, appositives; punctuation marks, exercises in morphology (present and past participles); spelling issues (hamza/glottal stop writing): conjunctive hamza (hamzatwasl) and hamzaqat', alef following group waw, aliflayyinah ('flexible alif') and nunation (tanwin).

Prerequisite: None

A0161200 English Language (Remedial) {3} [3-3]

Grammar: auxiliary verbs, the English tenses; vocabulary: relationships, media, places, appliances, activities; Writing Skills: paragraph writing, distinguishing between formal and informal letters; basic reading skills; basic listening skills; verbal skills: oral presentations, arguments, formal phone calls, and restaurants recommendation.

Prerequisite: None

A0331700 Computer Skills (Remedial) {3} [3-3]

IT essentials: introduction to personal computer, computer assembly, an overview of preventive maintenance; operating system (WINDOWS 10): settings, managing folders and files, search; basics skills in Microsoft word 2016; basics skills in Microsoft power point 2016; basics skills in Microsoft excel 2016.

Prerequisite: None